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THE SCHICK TEST, WITH ESPECIAL REFERENCE TO THE NEGRO *

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The Schick test is a simple intracutaneous test that indicates whether or not the person tested possesses a natural antitoxic immunity to diphtheria. Numerous recent observations in this country have not only confirmed the results obtained by Schick,¹ the originator of the test, but have brought out many additional points concerning its value and applications. The practical value of the test in the management and control of diphtheria has been definitely established.

Zingher,² in describing the reaction, says: "This reaction is characterized by a circumscribed area of redness and slight infiltration which measures from 1.0-2.5 cm. in diameter. It persists for seven to ten days, and on fading shows superficial scaling and a persistent brownish pigmentation." Practically all other observers describe it in identically the same way, and such is a true description of the reaction as it occurs in white people. All writers also agree that scaling and pigmentation are characteristic of all positive reactions.

This study was made to determine the following 2 points: 1. What color the pigmentation would be on very dark or black skins. 2. The degree of natural immunity to diphtheria that negroes possess, as evidenced by this test. Zingher,² Graef and Ginsberg,³ Neff,⁴ and others have carried out the test on negroes, but none of them make any mention of the above stated points.

This article is based on work done during an outbreak of diphtheria among the nurses and patients at the Freedmen's Hospital, Washington, D. C., which began Dec. 20, 1915, and continued throughout the month of January, 1916. Briefly, the test was carried out in the following manner:

Diphtheria toxin 14 months old was used. The toxin was diluted immediately before using with physiologic sodium chlorid solution, so that 0.2 c.c. represented $\frac{1}{50}$ M. L. D. of toxin for a 300 gm. guinea-pig. I used 0.2 c.c.

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¹ München. med. Wchnschr., 1913, 60, p. 2608.

² New York State Jour. Med., 1916, 16, p. 118.

³ Jour. Am. Med. Assn., 1915, 64, p. 1205.

⁴ Ibid., p. 585.

of the diluted toxin for each injection. All injections were made intradermally. The site chosen was the flexor surface of the forearm near the middle. In making the injection I discovered by experience that the method of inserting the needle into the skin, advocated by Rappaport,⁵ is very efficacious; and therefore I used it in most of these cases, although I was unaware at the time that anyone else was using it, as Rappaport's article was published subsequent to this work.

The test was carried out on 168 patients, 32 nurses, and 10 interns, making a total of 210 persons tested. Of the 210 persons, 207 were colored, while the remaining 3 were white. The color of the skin of the persons tested ranged from white to black. Light brown, dark brown, and black skins predominated. The ages were between 20 and 40 years; most were between 25 and 30 years. There were 135 females and 75 males in the group. None had received any previous injections of antitoxin.

Of the 210 persons tested, 86, or 40.95%, reacted positively, while 124, or 59.05%, reacted negatively. Six patients, not included in the preceding number, who had, 1 week before, received 1500 units of diphtheria antitoxin, were tested; they all reacted negatively. According to sex, the reactions were as indicated in Table 1.

TABLE 1
REACTIONS TO TEST, ACCORDING TO SEX

	Test +	Test —	Total
Males.....	26 or 34.2 %	49 or 65.8 %	75
Females.....	60 or 44.44%	75 or 55.56%	135

Pseudoreactions occurred in 10 cases; 6 of these were in persons who gave a positive Schick test, while 4 occurred in negative cases. These pseudoreactions were differentiated from true positive reactions by the following points, as established by Park, Zingher, and Serota,⁶ namely: that they appear earlier, are more infiltrated, less sharply circumscribed, disappear in 24-48 hours, and leave only a faintly pigmented area that never shows scaling. Cases showing the combined reaction offer greater chances of errors in reading than do cases that give a negative Schick test. Unfortunately, Zingher's method⁷ of control of these reactions had not appeared at the time this work was done, but I believe that its use will materially lessen the mistakes caused by the occurrence of these pseudoreactions.

⁵ Jour. Am. Med. Assn., 1916, 66, p. 1448.

⁶ Arch. Pediat., 1914, 31, p. 483.

⁷ Jour. Am. Med. Assn., 1916, 66, p. 1617.

Itching is the symptom most commonly described. In this series itching occurred rather infrequently, while by far the great majority of these people complained of local soreness. A few complained of slight degrees of pain. One unusually severe reaction occurred, which I am inclined to attribute to a hypersensitive condition of the patient's skin, as a 0.2 c.c. dilution of toxin was used and not a 0.1 c.c. dilution.

Over the zone of reaction in every positive case, there was an exaggeration of the normal lines of the skin together with a definite and, in some cases, marked roughening of the skin. The exaggerated normal skin lines resembled the grayish trails or striae seen on the surface of papules in lichen planus, and to which the term 'lichenification' could very appropriately be applied, just as it is to all other lesions that resemble lichen planus in this respect.

Daily measurements were made of the diameters of the reaction areas in all of the positive cases and records were kept. A maximum diameter was reached in 7 cases at the end of 24 hours, in 38 cases at the end of 48 hours, in 24 cases at the end of 72 hours, in 9 cases at the end of 4 days, in 1 case at the end of 5 days, and in 1 case at the end of 6 days. The 6 cases that showed combined reactions were not included in the preceding number. It is seen from the grouping of 80 cases, that the reaction area reaches its greatest size on the 2nd, 3rd, and 4th days, in most instances. The diameters of the reaction areas varied 1-3 cm.; most measured 1.2-1.4 cm.

Scaling occurred in all undoubtedly positive cases. The scales are often described as being 'silvery white' in color. In all of these cases the scales were white or grayish in color, even in very dark-skinned persons. A slight amount of infiltration and elevation was evident over the zone of reaction on palpation in every positive case.

As regards the pigmentation, it was found that the darker the skin, the darker the pigmentation. In white and very fair skins the pigmentation was of a light brown color, while in darker skins the pigmentation was darker than the color of the skin of the person tested. This was found to be true in every case; in some cases the pigmentation was black in color. This point is of especial interest to me, as the question was raised when I was beginning this work, whether I should be able to make satisfactory readings on very dark or black skins. I found the pigmentative reaction to be equally as clearcut and definite in all the cases I tested. From a scientific standpoint, it is only what one would expect, that is, that a pigmented race should show a greater pigmentative reaction to a pigment-producing stimulus than a non-

pigmented race. Occasionally, one does encounter a negro, who is literally so black that an increase in pigmentation is obviously an impossibility; but such persons are very rarely met with in this country. In such persons the exaggeration of the normal skin lines would be very noticeable and indicative of a positive reaction.

No person reacting negatively to this test received any prophylactic doses of antitoxin and none developed clinical diphtheria.

Two cases seemed to me to be of sufficient interest to warrant describing:

One was a woman who, 48 hours after injection, showed an erythematous area on her arm about 1 cm. in diameter; during the following night she developed a membrane in her throat, which was seen the next morning; at this time the diameter of the reaction area had increased to 1.5 cm.; she was immediately given 5000 units of antitoxin subcutaneously and on the following day (4 days after injection) the reaction area measured 0.6 cm., while 48 hours after the administration of the antitoxin there was no sign of the reaction present. The decrease in size and the rapid disappearance of the reaction were unquestionably due to the antitoxin that was given.

The other was the case of a girl who was intensely jaundiced. On her arm the entire area of reaction was the size of a 25-cent piece, in the center of which were numerous capillary hemorrhages causing an area about the size of a dime to be bright red in color, surrounded by a brownish-yellow zone. Marked pigmentation followed. The hemorrhages resulted from the irritant action of the toxin on a jaundiced skin. The pigment was derived, in part at least, from the blood.

A 2nd outbreak of diphtheria occurred at the hospital during the month of June, 1916, and it was traced to a nurse, who had showed a positive Schick reaction in December. She passed through a typical attack of diphtheria and gave positive cultures for diphtheria bacilli. Eleven other nurses who had reacted negatively to the test also gave positive cultures for diphtheria bacilli and were quarantined, but none of these developed clinical diphtheria and none received any antitoxin.

CONCLUSIONS

1. In practically all cases the pigment is darker in color than the skin.
2. The reaction is equally as clearcut in negroes as it is in whites.
3. This study of 210 cases indicates that adult negroes possess about the same degree of immunity to diphtheria as do white adults.
4. Lichenification occurs in all positive cases regardless of the color of the skin and promises to be of value in differentiating positive from negative reactions in those rare cases where an increase of pigmentation is impossible.